CLAIMS

1. A tool for facilitating the analysis of a glass forming machine which includes a blank station for forming a parison from a gob of molten glass having a number of mechanisms, a blow station for forming a parison into a bottle, having a number of mechanisms, a feeder system including a shear mechanism for shearing a gob from a runner of molten glass so that it can be delivered to the blank station, a mechanism for transferring a parison from the blank station to the blow station and a takeout mechanism for removing a bottle from the blank station,

wherein the glass forming machine has a set machine cycle time,

wherein each of the mechanisms has a predetermined cycle which is completed during the time of one machine cycle,

wherein the duration of each displacement of each of the mechanisms is determinable,

wherein interferences exist between the motion paths of the gob, the parison, the bottle and individual mechanisms,

wherein the thermal forming of the parison and bottle involve a number of thermal forming processes which are completed during the time of one machine cycle, each having a finite duration,

wherein process air is supplied for at least one process for a finite duration by turning a supply valve "on" and then "off" during the time of one machine cycle,

wherein an unwrapped bottle forming process wherein a gob of molten glass is sheared from a runner of molten glass, the gob is then formed into a parison in the blank station, the parison is then formed into a bottle in the blow station, and the bottle is then removed from the blow station, takes more than the time of one machine cycle to complete, and

wherein the start of each displacement for each mechanism and the turning of a supply valve "on" and then "off" are controlled events which are started in a selected sequence, comprising

a computerized model of a mathematical representation of a network constraint diagram of the unwrapped bottle forming process wherein a gob of molten glass is formed from a runner of molten glass, the gob is then formed into a parison in the blank station, the parison is then formed into a bottle in the blow station, and the bottle is then removed from the blow station.

2. A tool for facilitating the analysis of a glass forming machine according to claim 1, wherein the mathematical representation is a matrix representation.

3. A tool for facilitating the analysis of a glass forming machine according to claim 1, further comprising computer analysis means for analyzing the computerized model as a constrained optimization problem.

4. A tool for facilitating the analysis of a glass forming machine according to claim 3, wherein the constrained optimization problem is a quadratic programming problem.

5. A tool for facilitating the control of a machine which receives an initial product and transforms the initial product into a final product in a plurality of stations, the machine including

at least one mechanism at each station, each displaceable along a motion path from a retracted position to an advanced position and from the advanced position to the retracted position,

wherein the machine has a set machine cycle time,

wherein each of the mechanisms has a predetermined cycle which is completed during the time of one machine cycle,

wherein the duration of each displacement of each of the mechanisms is determinable,

wherein the start of each displacement is an event which is selectively actuated in a selected sequence during the time of one cycle of the machine, and

wherein the operation of the machine has a number of constraints including interferences which exist between the motion paths of individual mechanisms, the start and end times and the durations of displacement of the mechanisms, and

wherein an unwrapped process wherein the initial product is transformed into the final product takes more than the time of one machine cycle to complete, comprising

a computerized model of a mathematical representation of a network constraint diagram of the machine for the unwrapped process wherein the initial product is transformed into the final product.

6. A tool for facilitating the control of a machine according to claim 5, wherein said mathematical representation is a matrix representation.

7. A tool for facilitating the control of a machine according to claim 5, further comprising computer analysis means for analyzing the computerized model as a constrained optimization problem.

8. A tool for facilitating the control of a machine according to claim 7, wherein the constrained optimization problem is a quadratic programming problem.

9. A method of making a tool for facilitating the control of a glass forming machine which includes a blank station for forming a parison from a gob of molten glass having a number of mechanisms, a blow station for forming a parison into a bottle having a number of mechanisms, a feeder system including a shear mechanism for shearing a gob from a runner of molten glass so that it can be delivered to the blank station, a mechanism for transferring a parison from the blank station to the blow station and a takeout mechanism for removing a bottle from the blank station,

wherein the machine has a set cycle time,

wherein each of the mechanisms has a predetermined cycle which is completed during the time of one machine cycle,

wherein each displacement of each of the mechanisms has a determinable duration,

wherein interferences exist between the motion paths of the gob, the parison, the bottle and individual mechanisms,

wherein the thermal forming of the parison and bottle involve a number of thermal forming processes occurring during the time of one machine cycle and having finite durations,

wherein process air is supplied for at least one process for a finite duration by turning a supply valve "on" and then "off" during the time of one machine cycle, and

wherein each displacement of each of the mechanisms and each turning of a valve "on" and "off" occurs in a desired sequence, and

wherein an unwrapped bottle forming process wherein a gob of molten glass is formed from a runner of molten glass, the gob is then formed into a parison in the blank station, the parison is then formed into a bottle in the blow station, and the bottle is then removed from the blow station takes more than the time of one machine cycle to complete, comprising

defining a network constraint diagram for the unwrapped bottle forming process wherein a gob of molten glass is formed from a runner of molten glass, the gob is then formed into a parison in the blank station, the parison is then formed into a bottle in the blow station, and the bottle is then removed from the blow station,

translating the network constraint diagram into a mathematical representation of the network constraint diagram, and

defining a computerized model of the mathematical representation of the network constraint diagram.

10. A method of making a tool for facilitating the control of a glass forming machine according to claim 9, wherein said mathematical representation is a matrix representation.

11. A method of making a tool for facilitating the control of a glass forming machine according to claim 10, further comprising analyzing the computerized model as a constrained optimization problem.

12. A method of making a tool for facilitating the control of a glass forming machine according to claim 11, wherein the constrained optimization problem is a quadratic programming problem.

13. A method of making a tool for facilitating the control of a machine which receives an initial product and transforms the initial product into a final product in a plurality of stations,

wherein the machine has a set machine cycle time,

wherein each of the mechanisms is cycled during the time of one machine cycle,

wherein the duration of each displacement of each of the mechanisms is determinable,

wherein the start of each displacement is an event which is selectively actuated in a selected sequence during the time of one cycle of the machine, and

wherein the operation of the machine has a number of constraints including interferences which exist between the motion paths of individual mechanisms, and

wherein an unwrapped process wherein the initial product is transformed into the final product takes more than the time of one machine cycle to complete, comprising

defining a network constraint diagram for the unwrapped process wherein the initial product is transformed into the final product,

translating the network constraint diagram into a mathematical representation, and

defining a computerized model of the mathematical representation.

14. A method of making a tool for facilitating the control of a machine according to claim 13, wherein said mathematical representation is a matrix representation.

15. A method of making a tool for facilitating the control of a machine according to claim 13, wherein said mathematical representation is a matrix representation.

16. A method of making a tool for facilitating the control of a machine according to claim 15, further comprising analyzing the computerized model as a constrained optimization problem.

17. A method of making a tool for facilitating the control of a machine according to claim 16, wherein the constrained optimization problem is a quadratic programming problem.